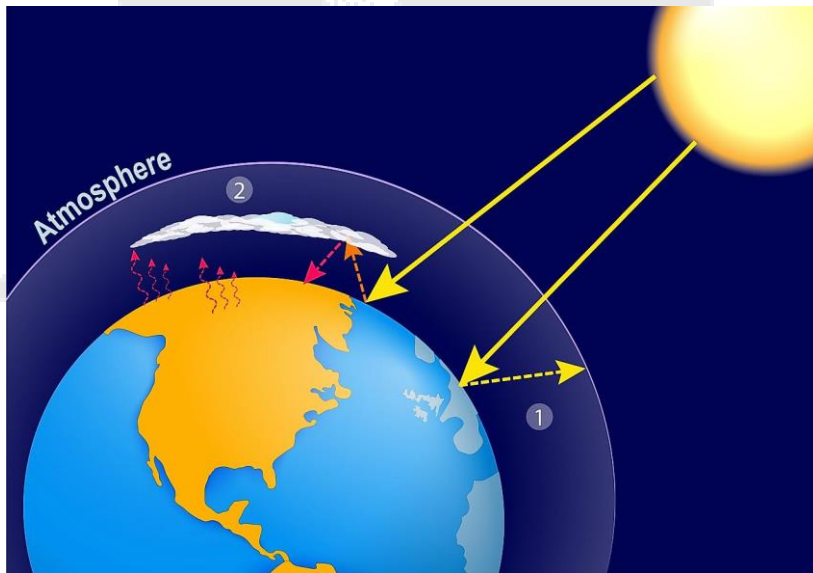


Earth Atmosphere



What is atmosphere?

- Atmosphere is the air surrounding the earth.
- The atmosphere is a mixture of different gases. It contains life-giving gases like Oxygen for humans and animals and carbon dioxide for plants.
- It envelops the earth all round and is held in place by the gravity of the earth.
- The atmosphere warms the earth during the daytime and cools at night.
- Earth's atmosphere has a thickness of around 300 miles (480 kilometres) but most of its gases are present within 16 km of the surface of the earth. When altitude increases, the air pressure in the atmosphere decreases. Actual air pressure lies around 950-1050 millibars generally.

Composition of the atmosphere

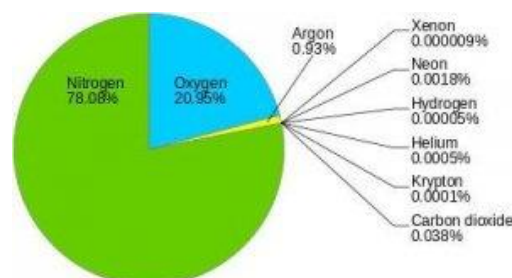
- The atmosphere is made up of different gases, water vapour and dust particles.
- The composition of the atmosphere is not static and it changes according to the time and place.
- In addition, it contains huge numbers of solid and liquid particles, collectively called aerosols.

Table 8.1 : Permanent Gases of the Atmosphere

Constituent	Formula	Percentage by Volume
Nitrogen	N ₂	78.08
Oxygen	O ₂	20.95
Argon	Ar	0.93
Carbon dioxide	CO ₂	0.036
Neon	Ne	0.002
Helium	He	0.0005
Krypto	Kr	0.001
Xenon	Xe	0.00009
Hydrogen	H ₂	0.00005

Gases

- Nitrogen and oxygen make up nearly 99% of the clean, dry air. The remaining gases are mostly inert and constitute about 1% of the atmosphere.



Nitrogen

- Nitrogen accounts for 78% of total atmospheric volume.
- Nitrogen is colourless and odourless.
- It is highly important for the survival of plants and animals.
- The main function of nitrogen is to control combustion by diluting oxygen. It also indirectly helps in the oxidation of different kinds.

Oxygen

- 21% oxygen is present in the atmosphere.
- Oxygen is the most important gas for all living beings on the earth.
- It is colourless and tasteless.
- Besides, oxygen can combine with other elements to form important compounds, such as oxides. Also, combustion is not possible without oxygen.

Argon

- 0.9% argon is composed in the atmosphere.
- This argon is mainly used in lights.

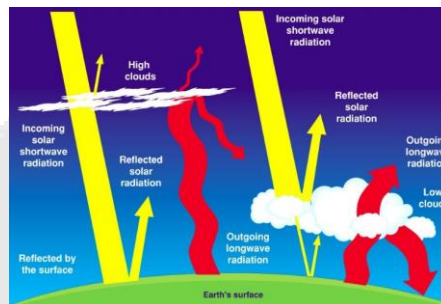
Carbon Dioxide

- 0.03% carbon dioxide is composed in the atmosphere.
- Plants mainly use carbon dioxide to produce oxygen.
- Carbon dioxide is referred to by a formula called CO₂.
- It is present in low concentrations and acts as a greenhouse gas.
- Carbon dioxide and water vapour are found only up to 90 km from the surface of the earth.
- Being an efficient absorber of heat, carbon dioxide is considered to be of great climatic significance. Carbon dioxide is considered to be a very important factor in the heat energy budget.
- With the increased burning of fossil fuels – oil, coal, and natural gas – the carbon dioxide percentage in the atmosphere has been increasing at an alarming rate.
- More carbon dioxide in the atmosphere means more heat absorption. This could significantly raise the temperature at lower levels of the atmosphere thus inducing drastic climatic changes.

Ozone (O₃)

- It forms less than 0.00006% by volume of the atmosphere and is unevenly distributed. It is between 20 km and 25 km altitude that the greatest concentrations of ozone are found. It is formed at higher altitudes and transported downwards.
- Ozone plays a crucial role in blocking the harmful ultraviolet radiation from the sun.
- If present in the lower troposphere, it turns out to be really harmful.
- Other gases found in almost negligible quantities in the atmosphere are neon, helium, hydrogen, xenon, krypton, methane, etc.

Water vapour



- The vapour content in the atmosphere ranges from 0 to 5 % by volume.
- The atmospheric vapour is received through the evaporation of moisture and water from the water bodies (like seas and oceans, lakes, tanks and ponds, rivers, etc.), vegetation, and soil cover.
- Vapour depends on temperature and therefore it decreases from the equator poleward in response to decreasing temperature towards the poles.
- More than 90% of the total atmospheric vapour is found up to the height of 5 km.
- The moisture content in the atmosphere creates several forms of condensation and precipitation e.g. clouds, fogs, dew, rainfall, frost, hailstorm, ice, snowfall, etc.
- Vapour is almost transparent for incoming shortwave solar radiation so that the electromagnetic radiation waves reach the earth's surface without many obstacles but vapour is less transparent for outgoing longwave terrestrial radiation and therefore it helps in heating the earth's surface and lower portion of the atmosphere because it absorbs terrestrial radiation.

Structure of the Atmosphere

- According to its composition, broadly it is divided into two layers-
 1. homosphere
 2. Heterosphere
- In the Homosphere, there are three regions: The Troposphere, the Stratosphere, and the Mesosphere.
- Although the composition of air is the same throughout these three regions, the concentration of air decreases significantly with increasing altitude.
- In the Heterosphere, there are two regions: The Thermosphere and the Exosphere. These two regions are considered outer space.

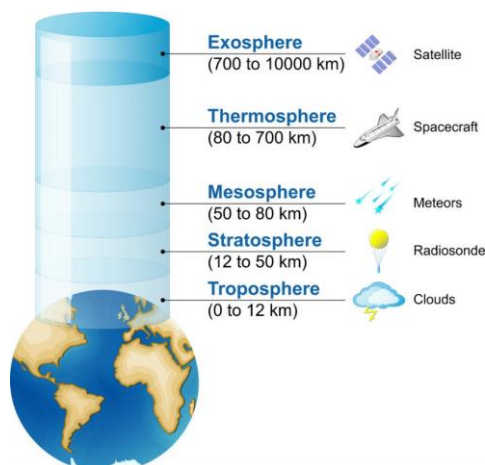
LAYERS OF THE ATMOSPHERE



Troposphere:

- It is the lowermost layer of the atmosphere. It extends up to 18km at the equator, 13 km at mid-latitude and about 8km at poles.
- It contains approximately 90% of the total mass of the atmosphere.
- The entire weather phenomenon takes place in this layer. It contains all the water vapour, dust particles, clouds, etc.
- In the troposphere, the temperature decreases with an increase in height.
- The average rate of decrease of temperature with height is called a normal lapse rate and it is equal to 6.4 degrees C/km. the rate of decrease of temperature is not constant everywhere.
- The minimum temperature attained in this layer is -57 degree C.
- Its top layer is called Tropopause. It acts as a boundary between the troposphere and stratosphere.

EARTH'S ATMOSPHERE

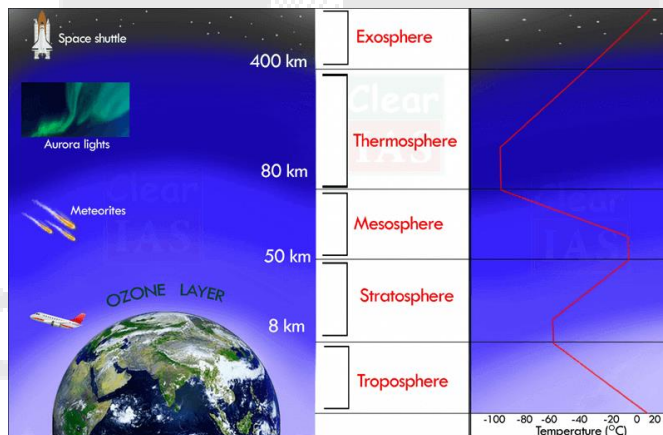


Stratosphere:

- In this layer, the temperature increases with an increase in height. The temperature varies from -57 to 0 degree C.
- This layer is characterized by the presence of the Ozonosphere. Ozone is a highly reactive oxygen molecule made up of three atoms.
- Ozone absorbs the high-frequency ultraviolet radiation. Because of this absorption the temperature of the layer increases.
- The energy absorbed is used in chemical reactions causing the formation of ozone gas.
- Ultraviolet rays are highly harmful to living organism including plants, animals as well as humans.

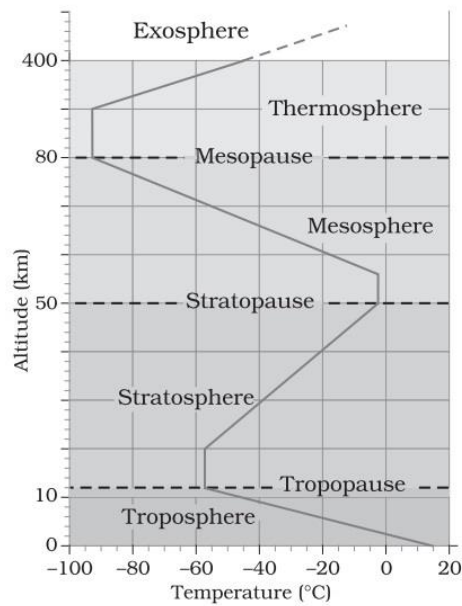
Mesosphere:

- This is the third layer that presents above the stratosphere above 50 km and it extends up to 85 km.
- The top of this layer is called Mesopause.
- This is the coldest part of the atmosphere where the temperature reaches about minus 90 degrees celsius.
- Meteors or falling stars occur in this layer.



Thermosphere

- This layer is located between 80 and 400 km above the mesopause.
- It contains electrically charged particles known as ions, and hence, it is known as the ionosphere.
- Radio waves transmitted from the earth are reflected back to the earth by this layer and due to this, radio broadcasting has become possible.
- The temperature here starts increasing with heights.
- This is also the layer where the auroras occur.
- The lower Thermosphere is called the Ionosphere.



Exosphere

- This is the outermost layer of the atmosphere
- This is the thinnest layer in the atmosphere.
- In this layer, the atmosphere merges into outer space.
- This layer is composed of very widely dispersed particles of hydrogen and helium. Therefore, the density of air is very less here.

Parcham Classes

Practice Question

- Which of the following statements concerning the atmosphere of the Earth is/are correct?

1. In the stratosphere, temperature increases with altitude.
2. In the mesosphere, temperature decreases with altitude.
3. The lowest temperature of the atmosphere is recorded in the upper part of the mesosphere.
4. The tropopause is an isothermal zone.

Select the correct answer code:

- a) 1, 2
- b) 1, 2, 3
- c) 3, 4
- d) 1, 2, 3, 4

- Which is the highest layer in the atmosphere

- a. Exosphere
- b. Stratosphere
- c. Troposphere
- d. Mesosphere

- In which sphere Ozone layer depletion is found?

- A. Ionosphere
- B. Stratosphere
- C. Lithosphere
- D. None of these

- The depletion in the Ozone layer is caused by:

- A. Carbon dioxide
- B. Nitrous oxide
- C. Methane
- D. Chlorofluorocarbon

- The main constituents of atmosphere are

- (a) N₂ and O₂
- (b) CO₂ and N₂
- (c) CO and CO₂
- (d) O₃ and SO₂

- Montreal protocol is related to the:

- A. Global warming
- B. Ozone layer depletion
- C. Sustainable development
- D. Food security

Question	Answer
1	d
2	a
3	b
4	d
5	a
6	b



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